REMARKS

Claims 1-4, 6-10 and 39-40 are rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,910,841 to Masao. The rejection is respectfully traversed.

Claim 1 is directed to a method for measuring one or more parameters of a periodic structure. In this method, a polychromatic beam of electromagnetic radiation is directed to the periodic structure and radiation from the beam is collected after it has been modified by the structure. The collected radiation is divided into two collected rays having different polarization states. The two rays are detected to provide two outputs and the one or more parameters of the periodic structure are derived from the two outlets.

It is believed to be well-settled that in order for a reference to anticipate a claim, there must be identity of elements between the reference and the claim. Masao fails this test. Thus, from the above, the method of claim 1 clearly requires that the one or more parameters of the periodic structure be derived from the two outputs, whereas Masao derives parameters not of a periodic structure but quantities such as the thickness and refractive index of a film. See, for example, column 1, lines 8-10, 40-47 and column 3, lines 16-18. In one embodiment, the one or more parameters of a periodic structure that is measured by the method of claim 1 includes the critical dimension, height and sidewall angle and other parameters of the periodic structures. See page 12, lines 13-16 of the specification and Fig. 9. There is, therefore, no identity of elements between Masao on the one hand and the rejected claims1-4 and 6-10 on the other.

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In the rejection, the Examiner relied on the embodiment in Fig. 5 and described in column 4, lines 55 through column 5, line 5 of Masao. In this embodiment, a light beam containing wavelengths in the three primaries R, G and B from a source 1 is expanded by a

collimator lens 2 and is incident on the sample. The reflected light is collected by a lens 4 and split into three light beams by means of beamsplitter 5 and a polarization beamsplitter 15. The analyzer and the polarization beamsplitter 15 are such that the three light beams are polarized light beams with different azimuthal angles. The three polarized light beams are respectively passed through three lenses 9 and three color filters 13 for passing the R, G and B wavelengths so that three images of the illuminated portion of the sample are formed on the three color CCD area sensors 10, respectively.

In other words, in the embodiment of Fig. 5 and the section of the specification referenced above relied on by the examiner in the rejection, Masao contemplates a system where the illumination beam is collimated and illuminates a large spot on the surface of sample 11. This spot is imaged onto three different CCDs, so that each detector in each of the three CCDs would detect light from the corresponding pixel within the illuminated large spot on the sample. As a result of the three color filters 13, the intensities of light from the corresponding pixel within a certain range of one of the R, G and B wavelengths are averaged and would reach the corresponding CCD to provide an output at each of the detectors within the CCD array. Thus, for each pixel in the illuminated spot on sample 11, three corresponding outputs are provided by detectors in the three CCD arrays within the averaged R, G and B wavelengths. The different azimuthal polarization angles of the three rays from beamsplitters 5 and 15 are employed so that outputs corresponding to three different ranges of wavelengths (R, B and G) can be provided.

From the CCDs 10, three datapoints are provided by the detectors for each pixel in the illuminated spot on sample 11. While three data points may be adequate for detecting the thickness and index or refraction of a film on a substrate, such measurements are inadequate for determining parameters associated with a periodic structures, such as the critical

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dimension, height and sidewall angle. Where parameters are employed to define the profile of the periodic structure, the use of more than 3 parameters (such as parameters in lieu of or in addition to critical angle, height and sidewall angle) may be desirable or advantageous. In such event, Masao's system is even less likely to be useful. Hence, it is submitted that there is no reason or motivation for modifying Masao's system in order to measure parameters of a periodic structure, since the embodiments proposed by Masao are impractical for such measurements.

In certain other embodiments (described in column 5, lines 21-33), Masao refers to the possibility of replacing the color filters 13R, 13G and 13B by other color filters so that a change in the polarized states of the red, green and blue lightbeams can be detected. Even when this is performed, this would only result in a small increase in a number of datapoints, which would still be inadequate for measuring the parameters of periodic structures.

Based on the above, it is further believed that the rejected claims 1-4 and 6-10 are also non-obvious over Masao so that they are patentable over the art of record.

Claims 11, 44 and 50 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Masao. The rejection is respectfully traversed as applied to the claims now standing.

Claim 11 has been amended to require that the instrument focus the beam to the structure. This distinguishes claim 11 from Masao's. In contrast, Masao expands the beam from the light source by means of a collimator lens 2. The focusing by the instrument is important so that the beam is focused to a small area on the surface of the sample. As noted on the top of page 9 of the specification, the area available for targets for measuring the critical dimension and other features of periodic structures is typically limited so that target size is typically kept to a minimum, such as 25 microns square. The focusing by the

instrument of claim 11 permits the beam to be focused onto the target. In contrast, Masao expands the beam from the light source 1. Furthermore, claim 11 contains the limitation that the numerical aperture of the optics is smaller than that of the instrument. The significance of this feature is explained at the top of page 9 of the specification. Thus, a small percentage of light reflected from areas outside of the grating target can affect measurement accuracy. For this reason, a relatively large focusing numerical aperture is employed to keep the energy of the illumination beam focused on the small target area. For this reason, the illumination numerical aperture 72 in Fig. 3 is relatively large. On the other hand, a large numerical aperture in the collection optics increases the computing time for modeling since the spectrum at more incident angels would need to be calculated. For this reason, it may be desirable to employ a small numerical aperture, such as aperture 74, shown in Fig. 3 for the collection optics. The above illustration is, of course, based on only one embodiment of the invention in claim 11 and claim 11 is not limited to such embodiment.

In Masao, on the other hand, the collimated illumination beam is not focused to a small area but instead illuminates a large spot on the surface of the sample 11. Since the large spot is then, in turn, imaged onto CCDs, there appears to be no large spread of incident angles in the collection optics, so that the collection numerical aperture need not be limited. The examiner has failed to articulate why the reasons set forth in the office action would support the rejection in view of the <u>specific feature</u> of claim 11 regarding numerical aperture.

For the reasons above and those indicated below, claim 11 is believed to be patentable over Masao and any other art of record.

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Claim 39 contains the limitation of a processing system processing a sample, where the processing system is responsive to the one or more parameters derived by a processor from two outputs of a detector for adjusting a processing parameter. This feature is not taught

or suggested by Masao at all and the Examiner has failed to address this feature in the rejection. On embodiment of the processing system is illustrated in Figs. 10 and 11 and the accompanying description on pages 12-14, where processing may involve, for example, an etching process. Masao clearly fails to teach or suggest any such features related to a processing system, such as those of the embodiment referred to above. The Examiner has likewise failed to explain why claim 39 is anticipated by Masao. For this reason, claim 39 and claim 40 dependent upon claim 39 are believed to be allowable.

Claim 44 has been amended to require that the one or more reflective optical elements focus or focuses radiation to the structure or collects or collect radiation from the structure. In order to provide adequate data to derive the parameters of the periodic structure such as critical dimension, height and sidewall angle, it would be very desirable for the detection system to be capable of detecting at wavelengths that range over wide range of wavelengths, such as from the ultraviolet to the infrared. For such purpose, it would be important for the optics employed in focusing the radiation to the structure or collecting radiation from the structure to employ reflective optics to avoid chromatic aberration. None of the above appears to be relevant to Masao. For example, Masao does not focus radiation to the sample; instead, a collimated beam is directed to a sample so that chromatic aberration is not a concern. Furthermore, Masao only envisions detection within the visible wavelength range of red, green and blue. With such a limited wavelength range, there would be little advantage in employing reflective optics rather than refractive optics to focus radiation since chromatic aberration is not a problem when a small wavelength range, such as the visible wavelength range of red, green and blue. Mirror 7 of Fig. 2 in Masao does not either focus radiation to the sample or collect radiation from the sample; it merely changes the direction of the

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collected ray so that beams can be combined. Therefore, claim 44 is believed to be allowable since it depends on claim 39 and further on the strength of the limitations therein.

Claims 12, 13, 16, 17, 20, 29-32, 34-37, 41-43, 45-49 and 51-55 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Masao in view of U.S. Patent No. 6,134,011 to Klein et al. The rejection is respectfully traversed.

In regard to claims 12 and 16, the Examiner admits that Masao differs from these two claims in that the angle of polarization is not altered in Masao. The Examiner nevertheless believes that this is taught by Klein et al. referring to column 4, lines 60-65. Such section of Klein et al., however, does not teach changing the angle of polarization. It merely teaches alternative ways to achieve given desired polarization states. Thus, such section of Klein et al. refers to two ways to produce circularly polarized light. In one embodiment, the light can be rendered to have a desired linear polarization by a linear polarizer 12 and such light is passed through a zero-order quarterwave plate 14 having an optic axis offset 45 degrees from the optic axis of the polarizer 12 to produce circularly polarized light. In an alternative embodiment, the light beam 100 can be linearly polarized at 45 degrees. Then Klein et al. went on to list yet another possible alternative where the light beam 100 is elliptically polarized. Column 4, lines 63-64. In other words, Klein et al. merely proposes three different alternative embodiments: where the beam incident on the sample is circularly polarized, 45 degree linearly polarized or elliptically polarized. That means that in any one embodiment, only one of the three polarizations of beam 100 is used so that Klein et al. also fails to teach altering the polarization plane or angle in the illumination beam. If the Examiner disagrees, it is respectfully requested that the Examiner explain in detail her interpretation of Klein et al. to support the rejection.

Claims 13, 17 and 20 are believed to be allowable since they depend from allowable claims 12 and 16 and further on the ground of the limitations in these claims. For example, claim 20 adds a limitation similar to that discussed above in reference to claim 11 discussed above.

Claim 29 has been amended to add the limitation that the apparatus inspects a sample having a periodic structure and having a processor deriving one or more parameters of the periodic structure from the at least one output of the at least one detector. For the same reasons as those explained above for claim 1, claim 29 is also believed to be allowable.

Claim 30-32 are believed to be allowable since they depend from allowable claim 31. They are further believed to be allowable on the strength of the limitations therein. For example, claim 30 adds the limitation that the system includes a polychromatic radiation source and that the second instrument causes translational motion of the source. While Klein et al. teaches an illumination system 7 that is movably suspended on a track, Klein's system involves a single wavelength ellipsometer where a laser diode is employed as the light source. A laser diode is much smaller and lighter than a polychromatic radiation source such as an arc lamp and can be moved without causing significant mechanical or vibration problems. It would not have been obvious to employ an instrument causing translational motion of a polychromatic radiation source such as an arc lamp such as in claim 30.

Claim 32 adds the limitation of an optical arrangement directing an incoming radiation beam to the detection system along different optical paths when relative motion is caused between the system and the sample, so that the different optical paths of the beam have substantially the same optical path length. Such limitation is not taught or suggested by Masao or Klein et al. and the Examiner has failed to address the limitation in this claim.

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Claim 34 has been amended to add the limitation that the at least one detector comprises a spectrometer detecting at a plurality of distinct wavelengths simultaneously. As noted above, for the purpose sought to be achieved by Masao, providing three outputs each of which is obtained over the range of wavelengths is adequate for the purpose of detecting the thickness or index of refraction of a film. This, however, is inadequate for many other purposes, such as the detection of parameters of periodic structures. By requiring that the at least one detector comprises a spectrometer detecting at a plurality of distinct wavelengths simultaneously, the apparatus of claim 34 is capable of detecting a much wider variety of structures, including periodic structures. This is not possible with the system of Masao. However, for the purpose sought to be achieved by Masao, providing three outputs each of which is obtained over a range of wavelengths is quite adequate so that there appears to be no reason or motivation to modify Masao by employing a spectrometer. Klein et al. teaches a single wavelength ellipsometer and, therefore, fails to teach or suggest a spectrometer detecting at a plurality of wavelengths simultaneously.

For similar reasons as those explained above for claims 30-32, claims 35-37 are likewise believed to be allowable.

Claims 40-43 are also believed to be allowance since they depend from allowable claim 39 and further on the ground of the limitations in these claims. Thus, claim 40 adds a limitation parallel to claim 35 above, and claim 43 adds a limitation similar to that of claim 32 discussed above.

For substantially the same reasons as those explained above for claim 39, claim 45 and 51 are believed to be allowable. Claims 46-49 and 52-55 are believed to be allowable since they depend from allowable claims and on the ground of the limitations in these claims. Thus, claims 46 and 52 add a limitation parallel to that of claim 35. Claims 49 and 54 add

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limitations parallel to that of claim 32 discussed above. Claim 55 adds the limitation that the optical arrangement includes a radiation reflective element that moves together with the second instrument reflecting radiation towards the device along optical paths that are substantially at 45 degrees to a trajectory of the device when moved by the two instruments. Such limitation is clearly not taught or suggested by Masao or Klein et al. While Klein, in column 4, lines 33-37 discloses a movement of assembly stage 84 to scan the illuminated spot across the disk, it fails to teach or suggest the features of claims 32, 37, 43, 49 and 54 where the radiation beam originates from a source that does not move with the detection system (which includes the illumination system) but where the optical paths experienced by the incoming radiation beam remain substantially the same despite relative motion between the detection system and the sample. Such feature is clearly not taught or suggested by Klein et al. If the Examiner disagrees, it is respectfully requested that the Examiner spell out in detail the factual basis of such rejection and the teachings in Klein or any other reference relied upon. The same applies to the limitation in claim 55.

New claims 56-80 have been added to more adequately cover the invention. These claims are also believed to be allowable since they depend from allowable claims and because of the limitations in these claims for reasons explained above.

Applicants appreciate the indication that claims 23-28 are allowed and that claims 5, 14, 15, 18, 19, 20, 22, 33 and 38 would be allowable if rewritten in independent form. This has not been done since the claims upon which they depend are also believed to be allowable.

Claims 1-80 are presently pending in the application. Reconsideration of the rejections is respectfully requested and an early indication of the allowability of all the claims is earnestly solicited.

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

1. A method for measuring one or more parameters of a periodic structure, comprising:

directing a polychromatic beam of electromagnetic radiation to the structure;

collecting radiation from the beam after it has been modified by the structure;

dividing the collected radiation into two collected rays having different polarization states;

detecting the two rays to provide two outputs; and

deriving the one or more parameters from the two outputs.

2. The method of claim 1, wherein the dividing divides the collected radiation into an ordinary ray and an extraordinary ray, said two rays having substantially orthogonal polarizations.

3. The method of claim 1, wherein the directing includes passing the collected radiation through an optical element having a plane of polarization at an angle different from 0, 90, 180 and 270 degrees to the plane of incidence.

4. (Amended) The method of claim 1, wherein the dividing includes passing the collected radiation through an optical element having a plane of polarization at an angle of about 0, 45, 90, 135, 180, 225, 270 ~~and~~ or 315 degrees to the plane of incidence.

5. (Amended) The method of claim 1, wherein the directing directs an unpolarized beam to the structure, and wherein the dividing includes passing the collected radiation through an optical element having a plane of polarization at an angle of about 0, 90, 180 ~~and~~or 270 degrees to the plane of incidence.

6. An apparatus for measuring one or more parameters of a periodic structure, comprising:

an instrument directing a polychromatic beam of electromagnetic radiation to the structure;

optics collecting radiation from the beam after it has been modified by the structure;

a device dividing the collected radiation into two collected rays having different polarization states;

detectors detecting the two rays to provide two outputs; and

a processor deriving the one or more parameters from the two outputs.

7. The apparatus of claim 6, wherein the device divides the collected radiation into an ordinary ray and an extraordinary ray, said two rays having substantially orthogonal polarizations.

8. The apparatus of claim 6, wherein the instrument includes an optical element having a plane of polarization at a non-zero angle to the plane of incidence, wherein said plane of polarization is not perpendicular to the plane of incidence.

9. (Amended) The apparatus of claim 6, wherein the device includes an optical element having a plane of polarization at an angle to the plane of incidence, where the angle is about 0, 45, 90, 135, 180, 225, 270 ~~and~~or 315 degrees.

10. (Amended) The apparatus of claim 6, wherein the instrument directs an unpolarized beam to the structure, and wherein the device includes an optical element passing the collected radiation, said optical element having a plane of polarization at an angle of about 0, 90, 180 ~~and~~or 270 degrees to the plane of incidence.

11. (Amended) The apparatus of claim ~~4~~6, wherein the instrument focuses the beam to the structure and each of said ~~source~~ instrument and said optics has a numerical aperture, and wherein the numerical aperture of the optics is smaller than that of the ~~source~~ instrument.

12. A method for measuring one or more parameters of a periodic structure, comprising:

(a) directing a polychromatic beam of electromagnetic radiation to the structure in a plane of incidence;

(b) collecting radiation from the beam after it has been modified by the structure;

(c) passing the collected radiation through a first polarizing element having a polarization plane at a first angle to the plane of incidence;

(d) detecting the collected radiation passing through the element to provide an output;

(e) altering the first angle between the two planes to a different value and repeating (a), (b), (c) and (d), wherein said different value remains substantially stationary when (a), (b), (c) and (d) are repeated to provide at least an additional output; and

(f) deriving the one or more parameters from the outputs.

13. The method of claim 12, wherein said different stationary value of the angle is one of 0, 45, 90, 135, 180, 225, 270 and 315 degrees.

14. The method of claim 12, wherein said directing includes passing radiation through a second polarizing element having a polarization plane at a second angle to the plane of incidence, said second angle having a value different from 0, 90, 180 and 270 degrees.

15. The method of claim 14, wherein said polarization planes of the two elements are substantially parallel or perpendicular to each other.

16. An apparatus for measuring one or more parameters of a periodic structure, comprising:

a source directing a polychromatic beam of electromagnetic radiation to the structure in a plane of incidence;

optics collecting radiation from the beam after it has been modified by the structure;

a first polarizing element having a polarization plane at a first angle to the plane of incidence passing the collected radiation;

a detector detecting the collected radiation that has passed through the element to provide an output;

an instrument rotating the first element relative to the plane of incidence to alter the value(s) of the first angle to one or more different value(s) that remain substantially stationary when said detector is detecting the collected radiation, so that the detector provides at least one output before and after the first angle is altered; and

a processor deriving the one or more parameters from the outputs.

17. The apparatus of claim 16, wherein said different value of the first angle is one of 0, 45, 90, 135, 180, 225, 270 and 315 degrees.

18. The apparatus of claim 16, said source including a second polarizing element passing radiation to provide said beam, said second element having a polarization plane at a second angle to the plane of incidence, said instrument rotating one or more of the two elements relative to the plane of incidence to alter the value(s) of the first and/or the second angle to one or more different value(s) that remain substantially stationary when said detector is detecting the collected radiation.

19. The apparatus of claim 18, wherein said different value(s) of the first and/or second angle are one of 0, 45, 90, 135, 180, 225, 270 and 315 degrees.

20. (Amended) The apparatus of claim 16, wherein the source focuses the beam to the structure and each of said source and said optics has a numerical aperture, and wherein the numerical aperture of the optics is smaller than that of the source.

21. The apparatus of claim 16, wherein said source includes a second polarizing element having a polarization plane at an angle to the plane of incidence, said

second element passing radiation to provide said beam, said angle having a value different from 0, 90, 180 and 270 degrees.

22. The apparatus of claim 21, wherein said polarization planes of the two elements are substantially parallel or perpendicular to each other.

23. An apparatus for measuring one or more parameters of a periodic structure, comprising:

an optical device including a first element directing a polychromatic beam of electromagnetic radiation to the structure in a plane of incidence and a second optical element passing radiation from the beam after it has been modified by the structure, said two elements attached together to form an integrated unit or being an integral unit;

said second element having a plane of polarization; and

at least one detector detecting the collected radiation that has passed through the second element to provide at least one output.

24. The apparatus of claim 23, said plane of polarization is at an angle to the plane of incidence, said angle having a value different from 0, 90, 180, 270 degrees.

25. (Amended) The apparatus of claim 24, wherein said plane of polarization is at an angle of about 0, 45, 90, 135, 180, 225, 270 or 315 degrees to the plane of incidence.

26. The apparatus of claim 23, wherein the second element divides the radiation from the beam after it has been modified by the structure into an ordinary ray and an extraordinary ray, said two rays having substantially orthogonal polarizations, said apparatus further comprising two detectors, each of the two detectors detecting a corresponding one of the two rays.

27. The apparatus of claim 23, wherein each of said two elements has a numerical aperture, and wherein the numerical aperture of the second element is smaller than that of the first.

28. The apparatus of claim 23, further comprising a processor deriving the one or more parameters from the output.

29. (Amended) An apparatus for inspecting a sample having a periodic structure thereon, comprising:

(a) a detection system including:

a device directing a polychromatic beam of electromagnetic radiation to the structure;

optics collecting radiation from the beam after it has been modified by the structure; and

at least one detector detecting the collected radiation to provide at least one output;

(b) a first instrument causing translational motion of the sample in a first direction; [and]

(c) a second instrument causing translational motion between the first instrument and the system in a second direction transverse to the first direction; and

(d) a processor deriving one or more parameters of the periodic structure from the at least one output.

30. (Amended) The apparatus of claim 29, said system further including a polychromatic radiation source, and the second instrument causes translational motion of the source.

31. The apparatus of claim 29, said system further including a conduit carrying a collimated beam of radiation.

32. The apparatus of claim 29, further including an optical arrangement directing an incoming radiation beam to the detection system along different optical paths when relative motion is caused between the system and the sample, so that the different optical paths have substantially the same optical path length.

33. The apparatus of claim 29, said arrangement including a radiation reflective element that moves together with the second instrument reflecting radiation towards the device along optical paths that are substantially at 45 degrees to a trajectory of the device when moved by the two instruments.

34. <u>(Amended)</u> An apparatus for inspecting a sample having a structure thereon, comprising:

(a) a detection system including:

a device directing a polychromatic beam of electromagnetic radiation to the structure;

optics collecting radiation from the beam after it has been modified by the structure; and

at least one detector detecting the collected radiation to provide at least one output<u>, said detector comprising a spectrometer detecting the collected radiation at a plurality of distinct wavelengths simultaneously</u>;

(b) an instrument causing first motion of the sample, and second motion between the first instrument and the system, wherein one of the two motions is translational and the remaining motion is <u>translational or</u> rotational.

35. <u>(Amended)</u> The apparatus of claim 34, said system further including a <u>polychromatic</u> radiation source.

36. The apparatus of claim 34, said system further including a conduit carrying a collimated beam of radiation.

37. The apparatus of claim 34, further including an optical arrangement directing an incoming radiation beam to the detection system along different optical paths when relative motion is caused between the system and the sample, so that the different optical paths have substantially the same optical path length.

38. The apparatus of claim 34, said arrangement including a radiation reflective element that moves together with the second instrument reflecting radiation towards the device along optical paths that are substantially at 45 degrees to a trajectory of the device when moved by the two instruments.

39. An integrated processing and detection apparatus for processing a sample having structures thereon, comprising:

(a) a detection system for finding one or more parameters of a structure, wherein the system detects the structure by directing a polychromatic beam of electromagnetic radiation to the structure, collecting radiation from the beam after it has been modified by the structure; said system including:

a device dividing the collected radiation into two collected rays having different polarization states;

detectors detecting the two rays to provide two outputs; and

a processor deriving the one or more parameters from the two outputs; and

(b) a processing system processing the sample, said processing system responsive to said one or more parameters for adjusting a processing parameter.

40. The apparatus of claim 39, said detection system further including a radiation source that provides the polychromatic beam.

41. The apparatus of claim 39, further including a conduit for transmitting radiation to said detection system.

42. The apparatus of claim 41, said conduit including an optical fiber.

43. The apparatus of claim 39, further including an instrument causing relative motion between the detection system and the sample in order to detect an area of the sample, an optical arrangement directing an incoming radiation beam to the detection system along different optical paths when relative motion is caused between the system and the sample, so that the different optical paths have substantially the same optical path length.

44. (Amended) The apparatus of claim 39, said detection system including one or more reflective optical elements that focus(es) radiation to the structure or collect(s) radiation from the structure.

45. An integrated processing and detection apparatus for processing a sample having structures thereon, comprising:

(a) a detection system for finding one or more parameters of a structure, wherein the system detects the structure by directing a polychromatic beam of electromagnetic radiation to the structure in a plane of incidence, collecting radiation from the beam after it has been modified by the structure; said detection system including:

a first polarizing element having a polarization plane at a first angle to the plane of incidence passing the collected radiation;

a detector detecting the collected radiation that has passed through the element to provide an output;

an instrument rotating the first element relative to the plane of incidence to alter the value(s) of the first angle to one or more different value(s) that remain substantially stationary when said detector is detecting the collected radiation, so that the detector provides at least one output before and after the first angle is altered; and

a processor deriving the one or more parameters from the outputs~~.~~;

(b) a processing system processing the sample, said processing system responsive to said one or more parameters for adjusting a processing parameter.

46. The apparatus of claim 45, said detection system further including a radiation source that provides the polychromatic beam.

47. The apparatus of claim 45, further including a conduit for transmitting radiation to said detection system.

48. The apparatus of claim 47, said conduit including an optical fiber.

49. The apparatus of claim 45, said system further including a second instrument causing relative motion between the detection system and the sample in order to detect an area of the sample, said system further including an optical arrangement directing an incoming radiation beam to the detection system along different optical paths when relative motion is caused between the system and the sample, so that the different optical paths have substantially the same optical path length.

50. (Amended) The apparatus of claim 45, said detection system including one or more reflective optical elements that focus(es) radiation to the structure or collect(s) radiation from the structur.

51. (Amended) An integrated processing and detection apparatus for processing a sample having a structures thereon, comprising:

(a) a detection system including:

a device directing a polychromatic beam of electromagnetic radiation to the structure;

optics collecting radiation from the beam after it has been modified by the structure; and

at least one detector detecting the collected radiation to provide at least one output;

(b) a first instrument causing motion of the sample;

(c) a second instrument causing relative motion between the first instrument and the system so that the beam has access to any location of the sample; and

(d) a processing system processing the sample, said processing system responsive to said at least one output for adjusting a processing parameter.

52. The apparatus of claim 51, said detection system further including a radiation source that provides the polychromatic beam.

53. The apparatus of claim 51, further including a conduit carrying a collimated beam of radiation to the detection system.

54. The apparatus of claim 51, further including an optical arrangement directing an incoming radiation beam to the detection system along different optical paths when relative motion is caused between the system and the sample, so that the different optical paths have substantially the same optical path length.

55. The apparatus of claim 51, said two instruments causing translational motion that are substantially perpendicular to each other, said arrangement including a radiation reflective element that moves together with the second instrument reflecting radiation towards the device along optical paths that are substantially at 45 degrees to a trajectory of the device when moved by the two instruments.

56. (New) The method of claim 1, wherein the detecting detects at least one of the two rays by means of a spectrometer to provide outputs at a plurality of wavelengths.

57. (New) The method of claim 1, wherein the directing comprises focusing radiation to the structure.

58. (New) The method of claim 1, wherein the detecting detects reflectance of the structure at a plurality of wavelengths.

59. (New) The method of claim 1, wherein the deriving derives a critical dimension, height or sidewall angle of the structure.

60. (New) The apparatus of claim 6, wherein at least one of the detectors comprises a spectrometer to provide outputs at a plurality of wavelengths.

61. (New) The apparatus of claim 6, wherein the instrument comprises an objective focusing radiation to the structure.

62. (New) The apparatus of claim 6, wherein at least one of the detectors detects reflectance of the structure at a plurality of wavelengths.

63. (New) The apparatus of claim 6, wherein the processor derives a critical dimension, height or sidewall angle of the structure.

64. (New) The apparatus of claim 29, wherein the processor derives a critical dimension, height or sidewall angle of the structure.

65. (New) The apparatus of claim 34, wherein the processor derives a critical dimension, height or sidewall angle of the structure.

66. (New) The apparatus of claim 39, wherein the processor derives a critical dimension, height or sidewall angle of the structure.

67. (New) The apparatus of claim 45, wherein the processor derives a critical dimension, height or sidewall angle of the structure.

68. (New) The apparatus of claim 51, wherein the processor derives a critical dimension, height or sidewall angle of a periodic structure of the sample.

69. (New) The method of claim 12, wherein the detecting detects at least one of the two rays by means of a spectrometer to provide outputs at a plurality of wavelengths.

70. (New) The method of claim 12, wherein the directing comprises focusing radiation to the structure.

71. (New) The method of claim 12, wherein the detecting detects reflectance of the structure at a plurality of wavelengths.

72. (New) The method of claim 12, wherein the deriving derives a critical dimension, height or sidewall angle of the structure.

73. (New) The apparatus of claim 16, wherein the detector comprises a spectrometer to provide outputs at a plurality of wavelengths.

74. (New) The apparatus of claim 16, wherein the source comprises an objective focusing radiation to the structure.

75. (New) The apparatus of claim 16, wherein the detector detects reflectance of the structure at a plurality of wavelengths.

76. (New) The apparatus of claim 16, wherein the processor derives a critical dimension, height or sidewall angle of the structure.

77. (New) The apparatus of claim 23, wherein the at least one detector comprises a spectrometer to provide outputs at a plurality of wavelengths.

78. (New) The apparatus of claim 23, wherein the first element comprises an objective focusing radiation to the structure.

79. (New) The apparatus of claim 23, wherein the at least one detector detects reflectance of the structure at a plurality of wavelengths.

80. (New) The apparatus of claim 23, further comprising a processor deriving a critical dimension, height or sidewall angle of the structure.